

Disclaimer:

This English translation is produced by machine translation and may contain errors. The JPO, the NCIP, and those who drafted this document in the original language are not responsible for the result of the translation.

Notes:

1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

Translated: 00:11:09 JST 03/30/2006

Dictionary: Last updated 03/24/2006 / Priority:

FULL CONTENTS

[Claim(s)]

[Claim 1] After incorporating the pressure-sensitive sensor chip in which the semiconductor distortion gauge was formed into the resin case which carried out insert molding of the lead terminal for external derivation In the semiconductor pressure sensor which connected between lead terminals with the sensor chip with the bonding wire, was further filled up with coating resin in the resin case, and covered the surrounding area of the sensor chip and the bonding wire The case penetration fields of this lead terminal including the junction of a lead terminal and a bonding wire are covered by gel with comparatively high hardness, or closure resin of adhesives. The semiconductor pressure sensor characterized by having filled up the field within the resin case which remains with the elasticity gel-like coating resin which has waterproofness and chemical resistance, and covering the surrounding area of a pressure-sensitive sensor chip and a bonding wire.

[Claim 2] In the state of the assembly which was the manufacture method of the semiconductor pressure sensor according to claim 1, included the pressure-sensitive sensor chip in the resin case, and connected the bonding wire between lead terminals After POTTINGU [the case penetration field of a lead terminal / gel-like closure resin with comparatively high hardness] first, heating hardening is carried out through **** processing. Next, the manufacture method of the semiconductor pressure sensor characterized by making it gel through a **** process and a heating hardening process after POTTINGU [all the fields within a resin case / elasticity gel-like coating resin] in the state of un-hardening.

[Claim 3] In the state of the assembly which was the manufacture method of the semiconductor pressure sensor according to claim 1, included the pressure-sensitive sensor chip in the resin case, and connected the bonding wire between lead terminals POTTINGU [the case penetration field of a lead terminal / adhesives] as closure resin Then, the manufacture method of the semiconductor pressure sensor characterized by carrying out heating hardening of adhesives and the coating resin simultaneously through a **** process after POTTINGU [all the fields within a resin case / elasticity gel-like coating resin] in the state of un-hardening.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the semiconductor pressure sensor applied to various fields focusing on the object for cars, and its manufacture method.

[0002]

[Description of the Prior Art] First, the composition of the surface pressurization type semiconductor pressure sensor which is the operation target of this invention is shown in drawing 3. The pressure-sensitive sensor chip which formed the measuring circuit to which 1 contains the semiconductor distorted gauge 1b in the diaphragm part [**** / a silicon chip] 1a in the figure, The glass plinth which 2 carried the pressure-sensitive sensor chip 1, and carried out anode junction in the vacuum (spacer), The resin case which 3 fabricated with thermoplastics, such as PPS (polyphenylene sulfide) and PBT (poly butylene terephthalate), The lead terminal for external derivation which 4 penetrated the resin case 3 and carried out insert molding to one (lead frame), The bonding wire which connected internally between the bonding pads and the lead terminals 4 which formed 5 in the terminal area of the pressure-sensitive sensor chip 1 (aluminum wire), [6 / 6 protecting the surface of the pressure-sensitive sensor chip 1, and the BONDEINGU wire 5 from a contaminant, humidity, etc. which are contained in a measuring pressure medium] Elasticity gel [the silicone gel which makes pressure to be measured transmit to the pressure-sensitive sensor chip 1, fluoro silicone gel, etc.] gel-like coating resin, and 7 are the caps with a ** pressure port put on said resin case 3.

[0003] The pressure which the principle of operation of this semiconductor pressure sensor is common knowledge, and is added through the ** pressure port of cap 7 to be measured is added to the surface of the pressure-sensitive sensor chip 1, through gel-like coating resin 6. The diaphragm part 1a of the pressure-sensitive sensor chip 1 changes by this, the gauge resistance value of the semiconductor distorted gauge 1b changes, and the electric signal which ****ed to pressure to be measured is taken out from the lead terminal 4 by the external circuit.

[0004]

[Problem to be solved by the invention] By the way, with the conventional products which fabricated the resin case 3 with thermoplastics, such as PPS and PBT, there is a problem which is described below in respect of the environment-proof nature and reliability about the above mentioned semiconductor type sensor. Namely, the anchor effect by the concavo-convex field on the surface of a terminal only commits the interface between the lead terminals by which insert molding was carried out to the resin case made from PPS and PBT resin, and this case. It originates in the die shrinkage produced at the time of fabrication of the resin case 3, and a coefficient-of-linear-expansion difference with the lead terminal 4, and the minute crevice g produces in the interface between both. For this reason, 150-13.3kPa/and abs if rapid negative pressure is added to a pressure sensor by the cycle examination which repeats pressurization and decompression in the range Air and humidity are attracted from the exterior (atmospheric pressure) through the minute crevice g which remains in the contact interface of the resin case 3 and a lead frame 4 like illustration, it invades in a resin case, and air bubbles are

generated in the layer of the gel-like coating resin 6 with which it was filled up in the resin case. And if **** is repeatedly added to the surface of the pressure-sensitive sensor chip 1, said air bubbles will grow. [receive the pressure-sensitive sensor chip 1 owing to this, and the BONDEINGU wire 5 receives corrosion, or] The bonding wire 5 may be disconnected and also the problem that the pressure introduced into the pressure sensor to be measured is no longer correctly transmitted to the pressure-sensitive sensor chip 1 in response to interference with air bubbles, and has a bad influence also on the measurement characteristic of a pressure sensor occurs.

[0005] This invention is made in view of the above-mentioned point, and the purpose solves said technical problem. the function as a pressure sensor -- rather -- ** -- it may be disadvantage, there are nothings and it is in offering the semiconductor pressure sensor which prevented invasion of the air into a resin case, and humidity, and cellular generating in a coating resin layer, and attained improvement-ization of the environment-proof nature and reliability, and its manufacture method.

[0006]

[Means for solving problem] In order to attain the above-mentioned purpose, after incorporating the pressure-sensitive sensor chip in which the semiconductor distortion gauge was formed into the resin case which carried out insert molding of the lead terminal for external derivation according to this invention In the semiconductor pressure sensor which connected between lead terminals with the sensor chip with the bonding wire, was further filled up with coating resin in the resin case, and covered the surrounding area of the sensor chip and the bonding wire The case penetration fields of this lead terminal including the junction of a lead terminal and a bonding wire are covered by gel with comparatively high hardness, or closure resin of adhesives. The field within the resin case which remains shall be filled up with the elasticity gel-like coating resin which has waterproofness and chemical resistance, the surrounding area of a pressure-sensitive sensor chip and a bonding wire shall be covered (Claim 1), and it shall specifically manufacture by the method of the account of following.

[0007] (1) in the state of the assembly which included the pressure-sensitive sensor chip in the resin case, and connected the bonding wire between lead terminals After POTTINGU [the case penetration field of a lead terminal / gel-like closure resin with comparatively high hardness] first, heating hardening is carried out through **** processing. Next, after POTTINGU [all the fields within a resin case / elasticity gel-like coating resin] in the state of un-hardening, it is made to gel through a **** process and a heating hardening process (Claim 2).

[0008] (2) in the state of the assembly which included the pressure-sensitive sensor chip in the resin case, and connected the bonding wire between lead terminals After POTTINGU [the case penetration field of a lead terminal / POTTINGU / as closure resin / adhesives and / all the fields within a resin case / elasticity gel-like coating resin] in the state of un-hardening continuously, heating hardening of adhesives and the coating resin is simultaneously carried out through a **** process (Claim 3).

[0009] Even if the crevice resulting from die shrinkage, a thermal expansion difference, etc. occurs in the interface between the lead terminals by which insert molding was carried out to the resin case and this case in the state of the assembly of a product according to the above-mentioned composition [carry out / locally / by gel with comparatively high hardness, or closure resin of adhesives / hermetic sealing of the penetration field which the lead terminal projected to the inner direction of a resin case] Also where rapid negative pressure is

added to a pressure sensor, through the crevice between a resin case and a lead terminal from the circumference invasion of the air into a case, and humidity, And the cellular generation in the coating layer with which it was filled up in the resin case resulting from invasion of air is prevented, and disconnection of the bonding wire resulting from this cellular generation and characteristic change of the pressure-sensitive sensor chip to pressure to be measured can be prevented.

[0010] Moreover, since it is covered with the elasticity gel-like coating resin which has the waterproofness with which the surrounding area of the pressure-sensitive sensor chip and the bonding wire was filled up in the resin case except for said field, and chemical resistance the communicative function of pressure to be measured -- rather -- ** -- it may be disadvantage and bad influences intermingled without things to the measurement pressure medium added to a pressure sensor, such as pollution gas and a liquid, are not received

[0011]

[Mode for carrying out the invention] The form of operation of this invention is hereafter explained based on the example shown in drawing 1 and drawing 2 . In addition, the same mark is given to the member corresponding to drawing 3 all over the figure of an example, and the detailed explanation is omitted. In this example although the fundamental structure as a pressure sensor is the same as that of drawing 3 [terminal / 4 / for external derivation / by which insert molding was carried out to the resin case 3 and one / lead] The lead terminals 4 including a junction with the bonding wire 5 cover the penetration field projected in a case by closure resin 8. Furthermore, throughout the inner direction of the resin case 3, it was filled up with elasticity gel-like coating resin 6 in the resin case as usual (refer to drawing 3), and the surrounding area of the pressure-sensitive sensor chip 1 and the bonding wire 5 is covered.

[0012] Here, waterproof and chemical-resistant high fluoride gel is used for gel-like coating resin 6, for example by with a degree of needle ON of about 70 elasticity, and it sets the layer thickness (thickness from the upper surface of the sensor chip 1) to about 0.8-1.5mm in consideration of the protection nature of the pressure-sensitive sensor chip 1 and the bonding wire 5. On the other hand, closure resin 8 sets the thickness to about 50-300 micrometers using the fluoro silicone gel with high hardness which is the about 30 degree of needle ON, fluoride gel or PPS resin, and the outstanding plastic glue of the adhesiveness over a lead terminal compared with coating resin 6.

[0013] Next, it is an assembly process at the time of using Adhesives 8a as said closure resin 8 Drawing 2 (a) - (d) It explains. Namely, in the state of the assembly which included the pressure-sensitive-sensor chip 1 in the resin case 3 with the glass plinth 2, and connected the bonding wire 5 between the pressure-sensitive sensor chip 1 and the lead terminal further It is drawing 2 (a) first. POTTINGU so that the penetration field where the lead terminal 4 projected the adhesives 8a accommodated in the dispenser 9 so that it might be shown to the method of the inside of a case may be covered. Then, drawing 2 (b) POTTINGU [elasticity fluoride gel / which was accommodated in another dispenser 9 so that it might be shown / gel-like coating resin 6 / the inner direction of the resin case 3] in the state of un-hardening (state of the shape of sol which mixed the polymerization agent to base resin) It is filled up so that the pressure-sensitive sensor chip 1 and the bonding wire 5 may be covered and it may spread to all the corners within a case.

[0014] Next, drawing 2 (c) After fully deaerating the air bubbles which carry out vacuum suction of the inside of a tub after accommodating the resin case 3 in ***** 10 like, and are mixed in gel-like coating resin 6 and Adhesives 8a, It is drawing 2 (d) about the resin case 3. It moves to the shown cure furnace (constant temperature bath) 11, and heating hardening of coating resin 6 and the adhesives 8a is carried out simultaneously here. Moreover, in using gel with hardness comparatively high as closure resin 8, it shall carry out by the following methods. namely, -- as opposed to the resin case 3 -- drawing 2 (a) after POTTINGU [the penetration field of the lead terminal 4 / gel] using a dispenser 9 similarly -- drawing 2 R> 2 (c) and (d) It moves to **** and a hardening process and hardening processing is carried out. Next, drawing 2 (b) After POTTINGU [the resin case 3 / elasticity gel-like coating resin 6] in the state of un-hardening similarly, coating resin 6 is made to gel through a **** process and a heating hardening process.

[0015] In addition, it is checked from the result of the evaluation test (pressure operation cycle test) which the inventor etc. did about the semiconductor pressure sensor shown in drawing 1 that low-temperature-proof operation cycle nature improves by 3 to 5 times compared with the thing of composition conventionally.

[0016]

[Effect of the Invention] As stated above, according to the composition of this invention, the case penetration fields of this lead terminal including the junction of a lead terminal and a bonding wire are covered by gel with comparatively high hardness, or closure resin of adhesives. By filling up the field within the resin case which remains with the elasticity gel-like coating resin which has waterproofness and chemical resistance, and covering the surrounding area of a pressure-sensitive sensor chip and a bonding wire Also where rapid negative pressure is added to a pressure sensor, through the crevice between a resin case and a lead terminal from the circumference Invasion of the air into a case, and humidity, And the cellular generation in the coating layer with which it was filled up in the resin case resulting from invasion of air is prevented. Disconnection of the bonding wire resulting from this cellular generation and characteristic change of the pressure-sensitive sensor chip to pressure to be measured can be prevented, and a semiconductor pressure sensor with high environment-proof nature and reliability can be offered.

[Brief Description of the Drawings]

[Drawing 1] The sectional view showing the assembly structure of the semiconductor pressure sensor concerning the example of this invention

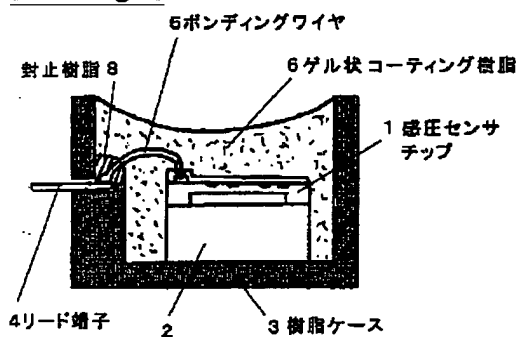
[Drawing 2] It is the explanatory view of the assembly method of the semiconductor pressure sensor shown in drawing 1 , and is (a). - (d) Figure which expressed the process from supply of closure resin and elasticity coating resin to heating hardening in order

[Drawing 3] The sectional view showing the assembly structure of the surface pressurization type semiconductor pressure sensor in the former

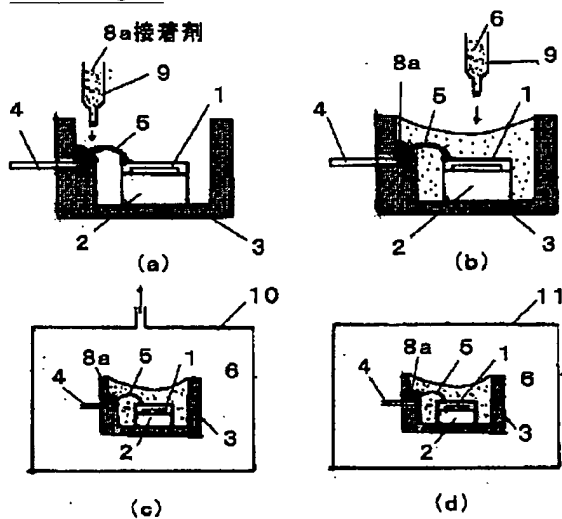
[Explanations of letters or numerals]

- 1 Pressure-sensitive Sensor Chip
- 3 Resin Case
- 4 Lead Terminal
- 5 Bonding Wire
- 6 Elasticity Gel-like Coating Resin
- 8 Closure Resin
- 8a Adhesives

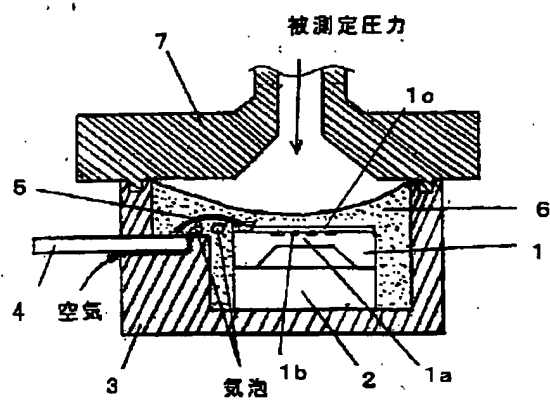
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]